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FISH & GAME DEPARTMENT

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RESERVOIR INVESTIGATIONS

Job Progress Report

Project F-53-R-7

Job No. II-a. Squawfish Control in Cascade Reservoir (Research)

Job No. II-b. Distribution, Survival and Growth of Game Fish in Cascade Reservoir (Research)

March 1, 1971 to February 29, 1972
by

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TABLE OF CONTENTS

Job No. II-a Page
ABSTRACT 1

RECOMMENDATIONS 2
OBJECTIVES 2

TECHNIQUES USED 2
Population Control 2
North Fork Payette Adult Treatment 2
Lake Fork Creek Adult Treatment 4
Gold Fork Creek Adult Treatment 4
North Fork Payette Fry Treatment 4
Life History Studies 4

FINDINGS 4

Population Control 4
North Fork Payette Adult Treatment 4
Lake Fork Creek Adult Treatment 5
Gold Fork Creek Adult Treatment 5
North Fork Payette Fry Treatment 5
Life History Studies 5
Job No. II-b
ABSTRACT 7
RECOMMENDATIONS 8
OBJECTIVES 8 TECHNIQUES USED:
Releases of Rainbow, Coho and Kokanee 8
Creel Census 8
Species Composition and Distribution 8
Age and Growth 8
Life History Studies 8
FINDINGS 10
Angling Pressure and Harvest 10
Catch Rates 10
Species Composition 22
Rainbow and Coho Age and Growth 22
Squawfish Age and Growth 22
Life History Studies 22
Rainbow and Coho Emigration 22

LIST OF FIGURES

Job No. II-a Page

Figure No. 1 Location of Squoxin dispensing stations and gill net sets for squawfish, Cascade Reservoir, 1971 3

Job No. II-b

Figure No. 1 Location of gill net sets for species composition trends, Cascade Reservoir, 1971 9

Figure No. 2 Catch rates of squawfish in fish per hour by boat anglers at Cascade Reservoir by two-week creel census intervals, 1968-1971 20

Figure No. 3 Catch rates of squawfish in fish per hour by bank anglers at Cascade Reservoir by two-week creel census intervals, 1968-1971 21

Figure No. 4 Length frequency distribution of 748 squawfish caught in horizontal gill nets at Cascade Reservoir, 1971 29

LIST OF TABLES

Job II-b

Table No. 1. Estimates of total hours fished and catch by boat anglers at Cascade Reservoir by two-week intervals from April 17 - September 17, 1971 11

Table No. 2. Estimates of total hours fished and catch by bank anglers at Cascade Reservoir by two-week intervals from April 17 - September 17, 1971 12

Table No. 3, Percentage of fishing effort by boat and bank anglers in four counts made at two-hour intervals during creel census at Cascade Reservoir, April 17 - September 17, 1971 13

Table No. 4. Weekly distribution of angler effort by day-class for two-week creel census intervals, Cascade Reservoir, 1971 14

Table No. 5. Percentage composition of boat angler catch at Cascade Reservoir by two-week creel census intervals, April 17 - September 17, 1971 15

Table No. 6, Percentage composition of bank angler catch at Cascade Reservoir by two-week creel census intervals, April 17 - September 17, 1971 16

LIST OF TABLES (Continued)

Job II-b Page

Table No. 7. Comparison of percentage composition of estimated angler harvest at Cascade Reservoir for 1968, 1969, 1970 and 1971 17

Table No. 8. Catch rates of boat anglers interviewed at Cascade Reservoir by two-week intervals, April 17 - September 17, 1971 18

Table No. 9. Catch rates of bank anglers interviewed at Cascade Reservoir by two-week intervals, April 17 - September 17, 1971 19

Table No. 10. Comparison of estimated angling pressure, angler harvest, and overall average catch per hour at Cascade Reservoir for 1968, 1969, 1970, and 1971 23

Table No. 11. Species composition of horizontal gill net catches at Cascade Reservoir, 1971 .... 24 & 25

Table No. 12. Species composition, temperature profile and depth distribution of fish captured in three vertical gill net sets SW of Sugar-loaf Island, Cascade Reservoir, August 26, 1971 26

Table No. 13. Species composition, temperature profile and depth distribution of fish captured in three vertical gill net sets in the SE corner of Cascade Reservoir, August 27, 1971 26

Table No. 14. Length frequency distribution of Cascade Reservoir rainbow trout measured in the creel, 1971 27

Table No. 15. Length frequency distribution of Cascade Reservoir coho salmon measured in the creel, 1971 28

Table No. 16. Estimates of total hours fished and catch by anglers fishing the North Fork Payette River between Cascade Dam and the Highway 55 Bridge from April 17 - September 17, 1971 30

JOB PROGRESS REPORT

RESEARCH PROJECT SEGMENT

State of Idaho

Name: LAKE AND RESERVOIR INVESTIGATIONS

Project No. F-53-R-7

Title: Squawfish Control in Cascade Reservoir (Research)

Job No. II-a

Period Covered: March 1, 1971 to February 29, 1972

ABSTRACT:

Beginning at 10:45 a.m. on July 7, 1971, fisheries personnel dispensed 81 gallons of Squoxin from three drip stations into a river flow of 500 cfs over a 26.75-hour period to kill an estimated 20,000 squawfish spawners in the North Fork of the Payette River. As was the case in 1970, high and cold water conditions in the North Fork during spawning time may have contributed to the apparent reduction in number of squawfish spawners. There has been a decrease in numbers of squawfish killed each year since the treatment project began in 1968.

Even though no concentrated squawfish spawning run developed in Lake Fork Creek in 1971, project personnel dispensed approximately 8 gallons of Squoxin into a stream flow of 150 cfs over a nine-hour period on July 8. Only about 150 squawfish were killed in Lake Fork Creek in 1971.

Project personnel treated Gold Fork Creek on July 20, 1971. We dispensed 22 gallons of Squoxin into a stream flow of 290 cfs over an 11-hour period to kill an estimated 4,500 squawfish spawners.

We killed numerous squawfish fry and several thousand squawfish fingerlings in the North Fork of the Payette River by dispensing 20 gallons of Squoxin into a stream flow of 80 cfs over a 40-hour period from August 2-4, 1971.

As in past years, there were no noted mortalities of game fish; only incidental losses of dace and sculpin and no mortalities of insects or other aquatics during or after the Squoxin treatments.

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RECOMMENDATIONS:

Continue the use of Squoxin in the spawning streams to further reduce the squawfish population in Cascade Reservoir.

Continue reservoir investigations to determine the extent of squawfish fry recruitment from the tributaries and the location of possible shoreline spawning areas in the reservoir.

Continue the creel census and other species composition studies to evaluate effects of squawfish control on game fish harvest and growth.

OBJECTIVES:

To study squawfish life history and distribution and to evaluate a partial control program at Cascade Reservoir.

TECHNIQUES USED:

Population Control

Project personnel used Squoxin for the fourth consecutive year to eradicate squawfish spawners in the North Fork of the Payette River in 1971. Lake Fork Creek and Gold Fork Creek squawfish runs were also treated in 1971 marking the second and third years, respectively, that these Cascade tributaries had been treated.

North Fork Payette Adult Treatment

Fisheries personnel began treating the North Fork of the Payette River at Lardo Dam at 10:45 a.m. on July 7, 1971. We dispensed 81 gallons of Squoxin from three drip stations (Figure 1) into a river flow of 500 cfs over a 26.75 hour period (a calculated dosage of 67 p.p.. billion). Adult squawfish, juvenile squawfish and hatchery rainbow trout were placed in bioassay containers at four locations (McCall Hatchery, Sheep Bridge, Old Ford, and Moore's Bridge)in the river to monitor the downstream progress of the toxin.

As in 1970, we used compressed air to force the Squoxin out of the barrels through a valve system and into the stream.

We collected benthic and drifting insect samples immediately before and after the treatment. Insect samples were also taken daring late August as a follow-up for comparison with the earlier samples. These collections were made to further establish that Squoxin is non-toxic to stream invertebrates.

Jim Keating and I flew over the 18-mile length of the North Fork between Lardo Dam and the Cascade Reservoir backwaters on July 8 to estimate the total squawfish kill.

We examined 73 dead female squawfish at Sheep Bridge and 69 at Moore's Bridge after the treatment to determine spawning conditions.

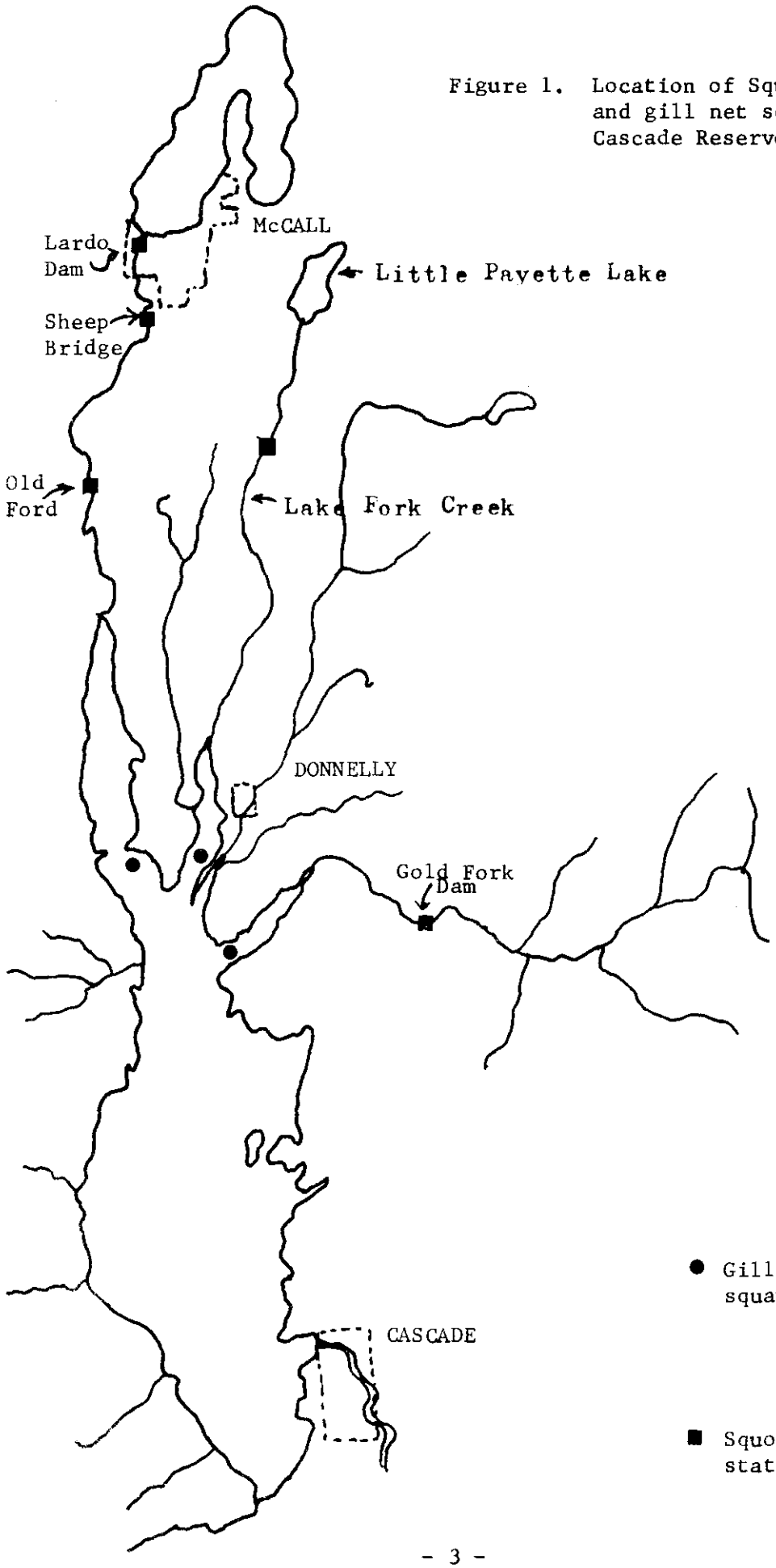

Figure 1. Location of Squoxin dispensing stations and gill net sets for squawfish, Cascade Reservoir, 1971.

Lake Fork Creek Adult Treatment

We dispensed 8 gallons of Squoxin into a stream flow of 150 cfs over a nine-hour period from 10 a.m. to 7 p.m. on July 8, 1971. We used only one drip station on Lake Fork Creek at the Lake Fork diversion dam (Figure 1). We enumerated dead squawfish by walking along the stream.

Gold Fork Creek Adult Treatment

Project personnel treated Gold Fork Creek on July 20, 1971. We dispensed 22 gallons of Squoxin into a stream flow of 290 cfs over an 11-hour period from a drip station at the Aqueduct. We placed adult squawfish and stream-caught rainbow trout in bioassay containers at locations 1 and 2.5 miles below the drip station. All dead squawfish were counted in 3 one-half mile sample sections to obtain an estimated total kill by expansion.

We examined 79 female squawfish after the treatment to determine spawning condition.

North Fork Payette Fry Treatment

Beginning at 9:30 p.m. on August 2, 1971, project personnel treated the North Fork of the Payette River for squawfish fry by dispensing 20 gallons of Squoxin into a stream flow of 80 cfs over a 40-hour period. Drip stations and bioassay containers were placed at the same locations used during the adult treatment. We made spot checks for dead fry along the stream, but no attempt was made to estimate numbers killed.

Life History Studies

We set horizontal gill nets in each of the reservoir arms from early June until late July to monitor movements of squawfish into the tributaries and to collect fish for determination of sexual maturity. Gill nets were set periodically at six other locations in the reservoir to gain information on squawfish distribution; fish taken in these nets were also examined for sexual maturity.

Several deep pools along each of the tributary streams were blasted periodically to trace movements of the squawfish spawning run and to ascertain sexual development of the spawners.

We checked the streams periodically with explosives throughout the summer for emergence of squawfish fry or any late run of adults which might occur.

FINDINGS:

Population Control

North Fork Payette Adult Treatment

We began the North Fork treatment at 10:45 a.m. on July 7, 1971- Five hours after the treatment began all but two of the squawfish in the bioassay container at Sheep Bridge were dead. By 5:30 p.m, all squawfish in the area of Sheep Bridge were dead.. We began operating the Sheep Bridge drip station at 10:25 p.m, on July 7 and squawfish in the bioassay containers at Old Ford were all dead by 6:00 a.m. on July 8. We operated the drip station at Old Ford from 9:00 a.m, until 4:00 p.m, on July 8.

Jim Keating and I flew the river en Jul) 8 and estimated a total kill of 20,000 squawfish spawners. This is a further decline from past kills of 200,000 in 1968, 100,000 in 1969 and 65,000 in 1970. As was the case in 1970, however, high and cold water during June may have contributed to the decreased spawning run.

We found that 12.3 percent of the 73 female squawfish examined at Sheep Bridge after the treatment were spawned out- A post-treatment check of 69 female squawfish at Moore's Bridge showed that 18.8 percent were spawned out.

Lake Fork Creek Adult Treatment

Even though large numbers of squawfish were not evident in Lake Fork Creek, we decided to conduct a trial treatment on July 8. We killed approximately 150 squaw-fish between the drip station at the Lake Fork diversion dam and the Lake Fork bridge on Highway 55.

Gold Fork Creek Adult Treatment

We killed an estimated 4,500 squawfish spawners in Gold Fork Creek on July 20, 1971. This year's kill is much lower than the estimated 10,000 killed in 1969 but much higher than the 800 killed last year. It is difficult to determine exactly why this fluctuation occurred, but probably just indicates the importance of timing the treatment to catch the bulk of the spawning run. As I indicated above, abnormally high and cold water conditions in the spawning streams have hindered treatments for the past two years-

A post-treatment check of 79 female squawfish revealed that 81 percent were spawned out.

North Fork Payette Fry Treatment

We observed large concentrations of squawfish try in the pools below Sheep Bridge on July 29, 1971, We treated the North Fork for fry on August 2.

In addition to the numerous fry killed, several thousand six to eight-inch squaw-fish fingerlings were killed. The origin of these juvenile squawfish is unknown. They may have drifted into the river from Payette Lake or moved up from Cascade Reservoir backwaters after the adult treatment.

Life Histories Studies

The first significant concentrations of squawfish were noted in the North Fork of the Payette River on June 21, 1971. At this time, however, afternoon water temperatures were only 56°F with night water temperatures as low as 50°F. The river flow was approximately 2,000 cfs at Lardo Dam gauging station, Many squawfish spawners were still present in the North Fork two weeks later on July 7 indicating that the first fish observed may have been only precursors to the main spawning migration.

Large schools of squawfish fry were first observed in the shallows and pools below Sheep Bridge on duly 29, 1971, approximately three weeks after the main squaw-fish spawning run took place. No significant concentrations of squawfish fry were ever observed in Lake Fork Creek or Gold Fork Creek during 1971.

The ratio of female to male squawfish taken in horizontal gill nets set in Cascade Reservoir during 1971 was 5,9 to 1. This is even greater than the 4.7 to 1 ratio established in 1970. This predominance of females in the squawfish population may be a result of our early treatments (1968-69) killing a high percentage of males in the spawning streams. Males are known to remain in the spawning streams longer and are therefore less likely to escape back to the reservoir if the timing of treatment is late.

JOB PROGRESS REPORT RESEARCH PROJECT SEGMENT

State of Idaho Name: LAKE AND RESERVOIR INVESTIGATIONS

Project No. F-53-R-7 Title: Distribution, Survival and Growth of Game Fish at Cascade Reservoir (Research)

Job No. II-b

Period Covered: March 1, 1971 to February 29, 1972

ABSTRACT:

Project personnel continued the creel census and distribution, growth and survival studies of game fish in Cascade Reservoir during 1971.

Between April 13 and October 25, 1968, anglers on Cascade Reservoir fished 59,795 hours to catch 13,244 rainbow trout, 183 coho salmon, 15,400 yellow perch, 1,984 bullhead and 42,524 squawfish.

Between April 19 and October 31, 1969, anglers on Cascade Reservoir fished 66,694 hours to catch 15,511 rainbow trout, 6,142 coho salmon, 16,375 yellow perch, 1,343 bullhead and 21,160 squawfish.

Between April 18 and October 30, 1970, anglers on Cascade Reservoir fished 78,175 hours to catch 15,083 rainbow trout, 13,399 coho salmon, 17,935 yellow perch, 1,845 bullhead and 15,667 squawfish.

From April 17 to September 17, 1971, anglers fished an estimated 84,854 hours to catch 20,256 rainbow trout, 8,698 coho salmon, 38,011 yellow perch, 4,230 bullhead and 17,815 squawfish.

Of the 1971 total, boat anglers fished 59,631 hours and caught 56,170 fish including 27.5 percent rainbow trout, 14.0 percent coho salmon, 40.5 percent yellow perch, 0.6 percent bullhead and 17.4 percent squawfish. Bank anglers fished 25,223 hours for 32,675 fish including 14-5 percent rainbow trout 2.5 percent coho salmon, 46.6 percent yellow perch, 12.0 percent bullhead and 24.4 percent squawfish.

Horizontal gill nets fished fur 240 hours at five locations in Cascade Reservoir during 1971 caught 60. 2 percent squawfish, 12.9 percent coarsescale suckers, 11.9 percent yellow perch, 9.3 percent rainbow trout, 3.6 percent coho salmon, 1,7 per-cent bullhead and 0.4 percent whitefish.

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RECOMMENDATIONS:

Continue the creel census at Cascade Reservoir to monitor trends in the game and nongame fish harvest and angler pressure.

Continue to determine distribution and abundance of all species of fish by maintaining gill net stations.

Continue monitoring physical and chemical properties of the water at established sampling stations.

OBJECTIVES:

To evaluate the distribution, growth rates and returns to the creel of game fish in Cascade Reservoir,

To monitor the effects, if any, of the squawfish eradication program on the game fish populations in the reservoir.

TECHNIQUES USED:

Releases of Rainbow, Coho and Kokanee

During 1971, hatchery personnel released 50,000 rainbow catchables and 380,800 three-inch coho fingerlings into Cascade Reservoir. We also made an experimental plant of 124,000 three-inch kokanee fingerlings in the Tamarack Falls area of the North Fork of the Payette River arm of Cascade Reservoir.

Creel Census

We continued the boat count-interview creel census at Cascade Reservoir from April 17 through September 17, 1971. We censused every weekend day and holiday and three of ten weekdays during each of eleven two-week intervals.

Census techniques were the same as those used at Cascade every year since 1968.

I used the angler interview data to estimate total fishing effort by boat and bank anglers and the number of each species caught during each two-week census interval.

Species Composition and Distribution

We fished horizontal gill nets at five previously established stations and vertical gill nets at two sites to obtain species composition and distribution data for comparison with previous sample years from 1968 to date (Figure 1).

Age and Growth

We measured all fish taken in nets and rainbow and coho caught by anglers to establish length frequency distributions.

Life History Studies

We sexed and noted the condition of gonads of all fish species taken in gill nets, Fish were also examined for gross infestations of parasites or any unusual growths or tumors.

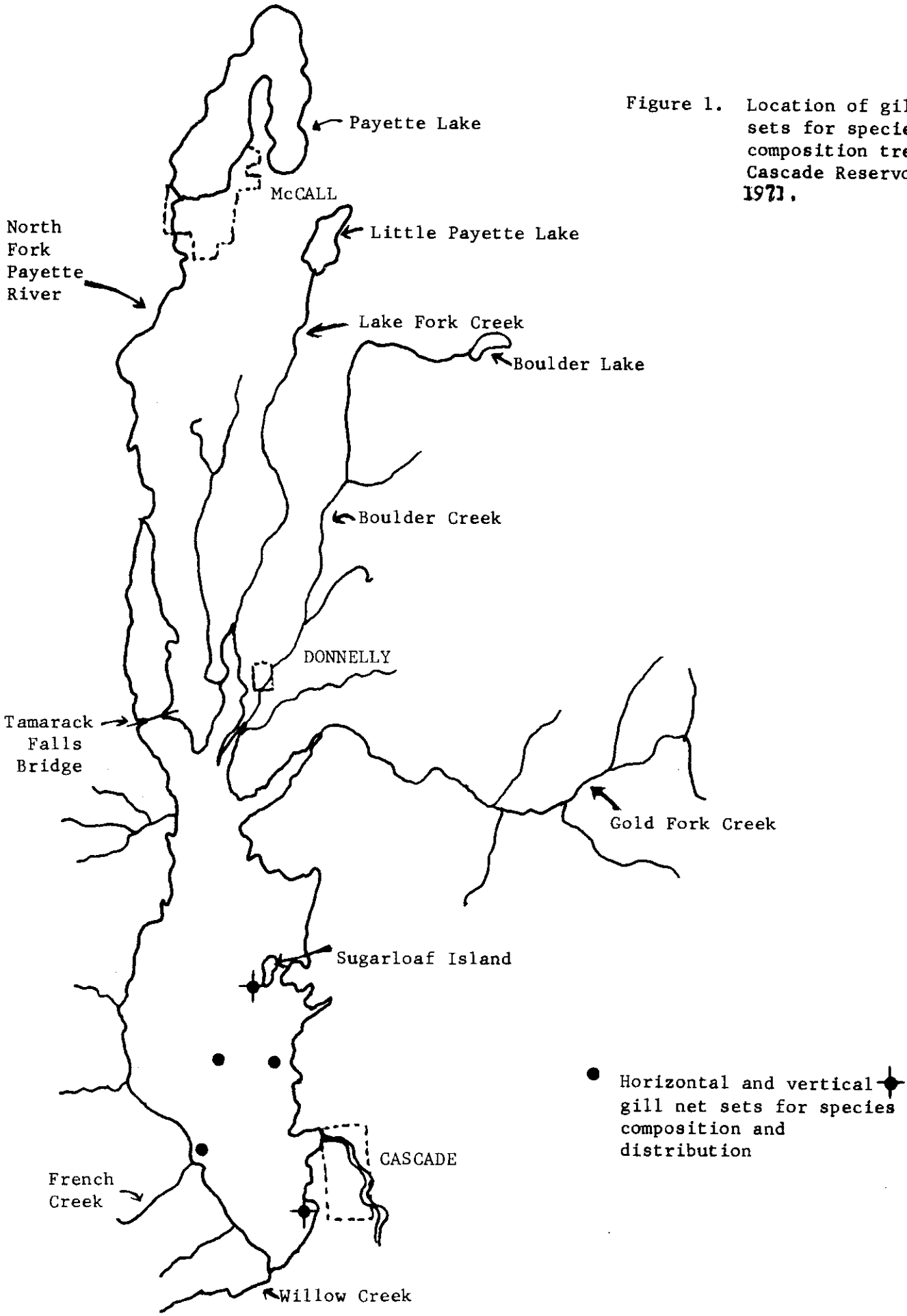

Figure 1. Location of gill net sets for species composition trends, Cascade Reservoir, 1971.

On May 18, 1971, we used an. electrical shocker in Willow Creek and Campbell Creek to obtain samples of rainbow spawners. These fish were examined for sexual maturity and origin (hatchery or wild).

We checked Campbell Creek in early September for rainbow fry abundance. Willow Creek was dry at this time,

FINDINGS:

Angling Pressure and Harvest

Boat anglers expended 70.3 percent (59.631 hours) of the total fishing effort at Cascade Reservoir in 1970, and took 63.2 percent (56,170) of the total catch (Table 1). Bank angling activity peaked in mid-May (Table 2) while boat pressure was greatest around July 4 (Table 1). On a daily basis, an average of 40 percent
of the boat angling activity took place at the 10:00 a.m, count. Bank angling peaked at 2:00 p.m, when 33 percent of the effort occurred (Table 3). By day-class, 42.4 percent of boat angling effort was expended on weekdays, while 54.7 percent of bank angling effort took place on week days (Table 4).

Yellow perch comprised an average of 39.2 percent and 45.9 percent of the boat and bank angler catch, respectively. Boat anglers caught 25.1 percent rainbow trout, 20.8 percent coho salmon, 0.3 percent bullhead and 14.6 percent squawfish. Bank anglers caught 13.2 percent rainbow trout, 4.3 percent coho salmon, 11.3 percent bullhead and 25.3 percent squawfish (Tables 5 & 6)..

Table 7 shows a comparison of the percentage composition of angler harvest from 1968-71 at Cascade Reservoir. The great increase in the yellow perch catch in 1971
is worth noting. Coho catch declined in 1971 possibly due to increased spillage during spring and early summer. The importance of bullheads in the bank catch continued to increase in 1971.

Catch Rates

In 1971, boat anglers on Cascade Reservoir had best success on rainbow trout (.38 fish per hour) during mid-May. Coho fishing was best from boats during early June (.26 fish per hour) and again in early September (.31 fish per hour). Bank anglers did best for rainbow during mid-May (.34 fish per hour) and for coho during early September (.31 fish per hour) (Tables 8 & 9).

Boat fishermen had excellent success for yellow perch in raid-May (1,95 fish per hour) and again in early September (1-07 fish per hour). Bank angling was also best for perch during these same periods--. 71 fish per hour in May and 1.6 fish per hour in early September. Bank angling for bullheads peaked at . 23 fish per out during
early June (Tables 8 & 9).

Catch rates of squawfish by boat and bank anglers peaked in mid-May (.35 fish per hour) and late June (.74 fish per hour), respectively (Tables 8 & 9). Squawfish catch rates by boat anglers were up slightly in four of the eleven census intervals when compared to 1970 rates. Bank angler catch rates were up in eight of the eleven census intervals (Figures 2 & 3).

Table 1. Estimates of total hours fished and catch by boat anglers at Cascade Reservoir by two-week intervals from April 17-September 17, 1971.

Interval	Starting Dates	Estimated hours fished	Estimated Catch					
			Rainbow	Coho	Perch	Bullhead	Squawfish	Total
I	4/17	39	10	29	0	0	0	39
II	5/1	918	343	110	240	0	116	809
III	5/15	1,024	388	188	1,997	0	358	2,931
IV	5/29	4,192	630	1,082	968	0	663	3,345
V	6/12	5,437	1,006	864	669	18	1,062	3,619
VI	6/26	22,147	6,977	2,790	4,164	222	2,835	16,988
VII	7/10	9,680	2,440	551	5,122	0	2,391	10.504
VIII	7/24	6,565	1,687	282	3,276	0	1,273	6,518
IX	8/7	3,854	743	420	1,295	13	258	2,729
X	8/21	2,807	620	643	1,883	0	379	3,475
XI	9/4	2,968	651	933	3,175	35	419	5,213
Total		59,631	15,495	7,892	22,789	288	9,754	56,170
Percent of catch			27.5	14.0	40.5	0.6	17.4	100.0
Catch per hour			0.260	0.132	0.382	0.048	0.164	0.943

Table 2. Estimates of total hours fished and catch by bank anglers at Cascade Reservoir by two-week intervals from April 17-September 17, 1971.

Interval	Starting dates	Estimated hours fished	Estimated Catch					
			Rainbow	Coho	Perch	Bullhead	Squawfish	Total
I	4/17	698	236	72	193	0	4	505
II	5/1	7,249	1,759	25	5,157	1,346	1,737	10,024
III	5/15	4,223	1,435	49	2,712	488	1,069	5,753
IV	5/29	4,178	368	155	1,948	564	1,040	4,075
V	6/12	1,682	184	22	506	389	1,132	2,233
VI	6/26	2,418	251	34	772	387	1,797	3,241
VII	7/10	1,511	0	12	929	260	383	1,584
VIII	7/24	950	10	0	671	163	144	988
IX	8/7	631	41	16	291	66	235	649
X	8/21	604	117	83	327	77	182	786
XI	9/4	1,079	243	338	1,716	202	338	2,837
Total		25,223	4,761	806	15,222	3,942	8,061	32,675
Percent of catch			14.5	2.5	46.6	12.0	24.4	100.0
Catch per hour			0.189	0.032	0.603	0.156	0.319	1.292

Table 3. Percentage of fishing effort by boat and bank anglers in four counts made at two-hour intervals during creel census at Cascade Reservoir, April 17-September 17, 1971.

Interval	Percent of effort occurring at each count time			
	8:00 a.m.	10:00 a.m.	2:00 a.m.	4:00 a.m.
Boat anglers				
I	11	22	45	22
II	10	38	35	17
III	10	51	22	17
IV	8	37	32	23
V	11	38	26	25
VI	17	41	27	15
VII	22	43	19	16
VIII	21	43	22	14
IX	20	42	26	12
X	17	45	26	12
XI	4	38	39	19
Boat angler average (%)	14	40	29	17
Bank anglers				
I	10	21	42	27
II	13	28	34	25
III	14	38	29	19
IV	7	26	35	32
V	10	29	36	25
VI	7	34	34	25
VII	15	22	35	28
VIII	10	35	29	26
IX	18	25	31	26
X	22	28	28	22
XI	10	24	33	33
Bank angler average (%)	13	28	33	26

Table 4. Weekly distribution of angler effort by day-class for two-week creel census intervals, Cascade Reservoir, 1971.

Interval	Percent of effort occurring per day-class		
	Saturdays	Sundays	Weekdays
Boat anglers			
I	17.9	53.8	28.3
II	34.8	32.4	32.8
III	33.2	39.9	26.9
IV	36.2	19.3	44.5
V	31.5	22.4	46.1
VI	13.7	19.7	66.6
VII	17.7	24.8	57.5
VIII	25.5	22.6	51.9
IX	27.7	24.9	47.4
X	35.3	32.2	32.5
XI	22.3	45.8	31.9
Boat angler average	26.9	30.7	42.4
Bank anglers			
I	19.6	23.6	56.8
II	26.0	21.2	52.8
III	30.0	26.8	43.2
IV	33.8	20.1	46.1
V	22.3	21.6	56.1
VI	11.5	23.2	65.3
VII	25.0	25.3	49.7
VIII	22.1	19.5	58.4
IX	27.3	11.7	61.0
X	32.9	28.0	39.1
XI	7.1	20.1	72.8
Bank angler average	23.4	21.9	54.7
Combined average	25.1	26.3	48.6

Table 5. Percentage composition of boat angler catch at Cascade Reservoir by two-week creel census intervals, April 17-September 17, 1971.

Interval	Starting Dates	Rainbow	Coho	Perch	Bullhead	Squawfish
I	4/17	25.6	74.4	0.0	0.0	0.0
II	5/1	42.4	13.6	29.7	0.0	14.3
III	5/15	13.2	6.4	68.2	0.0	12.2
IV	5/29	18.8	32.4	28.9	0.0	19.9
V	6/12	27.8	23.9	18.5	0.5	29.3
VI	6/26	41.1	16.4	24.5	1.3	16.7
VII	7/10	23.2	5.2	48.8	0.0	22.8
VIII	7/24	25.9	4.3	50.2	0.0	19.6
IX	8/7	27.2	15.4	47.5	0.3	9.6
X	8/21	17.9	18.5	54.2	0.0	9.4
XI	9/4	12.5	17.9	60.9	0.7	8.0
Overall average percent		25.1	20.8	39.2	0.3	14.6

Table 6 . Percentage composition of bank angler catch at Cascade Reservoir by two-week creel census intervals, April 17-September 17, 1971.

Interval	Starting Dates	Rainbow	Coho	Perch	Bullhead	Squawfish
I	4/17	46.8	14.2	38.2	0.0	0.8
II	5/1	17.5	0.3	51.4	13.4	17.4
III	5/15	25.0	0.8	47.1	8.5	18.6
IV	5/29	9.0	3.8	47.8	13.8	25.6
V	6/12	8.3	1.0	22.7	17.4	50.5
VI	6/26	7.8	1.0	23.8	11.9	55.5
VII	7/10	0.0	0.8	58.6	16.4	24.2
VIII	7/24	1.0	0.0	68.0	16.5	14.5
IX	8/7	6.3	2.5	44.8	10.2	36.2
X	8/21	14.9	10.5	41.6	9.8	23.2
XI	9/4	8.6	11.9	60.5	7.1	11.9
Overall average percent		13.2	4.3	45.9	11.3	25.3

Table 7. Comparison of percentage composition of estimated angler harvest at Cascade Reservoir for 1968, 1969, 1970, and 1971.

Year	Inclusive dates	Percentage Composition					
		Rainbow	Coho	Perch	Bullhead	Squawfish	Total
		BOAT ANGLERS					
1968	4/13-10/25	17.5	0.4	19.1	0.1	62.9	100.0
1969	4/19-10/31	23.2	13.1	31.7	0.4	31.5	100.0
1970	4/18-10/30	24.1	24.9	26.8	0.3	23.8	100.0
1971	4/17-9/17	27.5	14.0	40.5	0.6	17.4	100.0
		BANK ANGLERS					
1968	4/13-10/25	18.8	0.0	23.6	6.7	49.9	100.0
1969	4/19-10/31	30.0	4.3	17.6	5.8	41.3	100.0
1970	4/18-10/30	22.0	9.4	31.6	10.4	26.5	100.0
1971	4/17-9/17	14.5	2.5	46.6	12.0	24.4	100.0

Table 8 . Catch rates of boat anglers interviewed at Cascade Reservoir by two-week intervals, April 17-September 17, 1971.

Interval	Starting dates	Boat anglers interviewed	Hours fished	Number of fish caught					Catch per hour				
				Rb	Coho	Perch	Bull.	Sq.	Rb	Coho	Perch	Bull.	Sq.
I	4/17	5	13	3	10	0	0	0	.231	.769	.000	.000	.000
II	5/1	40	142	53	17	37	0	18	.373	.120	.261	.000	.127
III	5/15	58	217	82	40	423	0	76	.378	.184	1.950	.000	.350
IV	5/29	147	399	60	103	92	0	63	.150	.258	.231	.000	.158
V	6/12	190	611	113	97	75	2	119	.185	.159	.123	.003	.195
VI	6/26	428	1,045	329	132	196	10	134	.315	.126	.188	.010	.128
VII	7/10	253	575	145	33	304	0	142	.252	.057	.529	.000	.247
VIII	7/24	281	697	179	30	348	0	135	.257	.043	.499	.000	.194
IX	8/7	242	566	109	62	190	2	38	.193	.109	.336	.004	.067
X	8/21	188	481	106	110	314	0	65	.221	.229	.653	.000	.135
XI	9/4	119	424	93	133	454	5	60	.219	.314	1.070	.012	.141
Total		1,951	5,170	1,272	767	2,433	19	850					
All periods combined average									.252	.215	.531	.003	.158

Table 9. Catch rates of bank anglers interviewed at Cascade Reservoir by two-week intervals, April 17-September 17, 1971.

Interval	Starting dates	Bank anglers interviewed	Hours fished	Number of fish caught					Catch per hour				
				Rb	Coho	Perch	Bull.	Sq.	Rb	Coho	Perch	Bull.	Sq.
I	4/17	65	210	71	22	58	0	1	.338	.104	.276	.000	.005
II	5/1	310	1,147	278	4	816	213	275	.242	.004	.711	.186	.240
III	5/15	276	692	235	8	444	80	175	.340	.012	.643	.115	.253
IV	5/29	200	430	38	16	200	58	107	.088	.037	.466	.135	.249
V	6/12	77	156	17	2	47	36	105	.109	.013	.301	.231	.673
VI	6/26	84	144	15	2	46	23	107	.104	.014	.319	.160	.743
VII	7/10	72	122	0	1	75	21	31	.000	.008	.615	.172	.254
VIII	7/24	51	99	1	0	70	17	15	.010	.000	.707	.172	.152
IX	8/7	33	78	5	2	36	8	29	.064	.026	.462	.103	.372
X	8/21	40	109	21	15	59	14	33	.193	.138	.541	.128	.302
XI	9/4	32	80	18	25	127	15	25	.225	.313	1.590	.187	.313
Total		1,240	3,267	699	97	1,978	485	903					
All periods combined average									.156	.061	.603	.144	.323

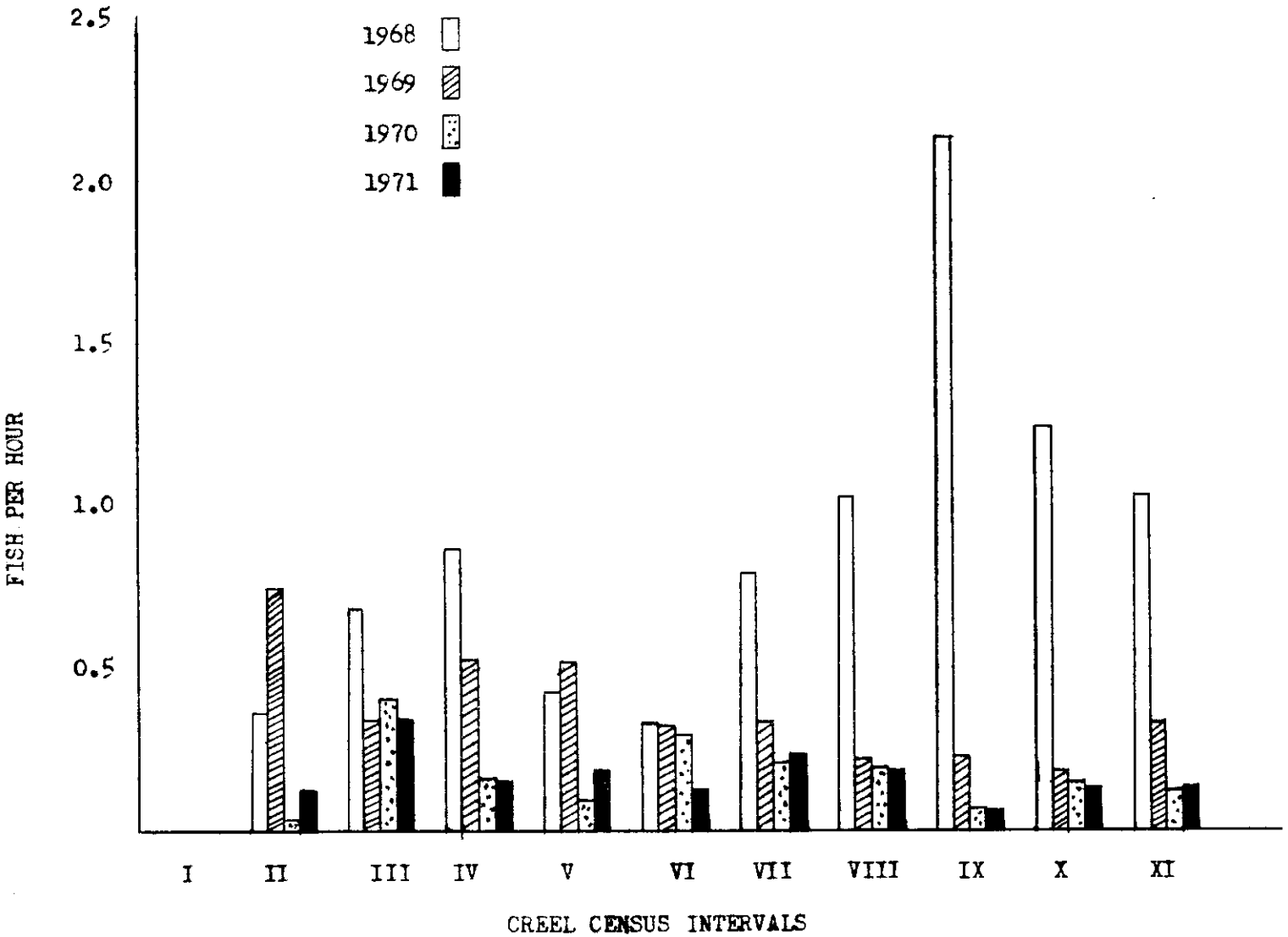

Figure 2. Catch rates of squawfish in fish per hour by boat anglers at Cascade Reservoir by two-week creel census intervals, 1968-1971.

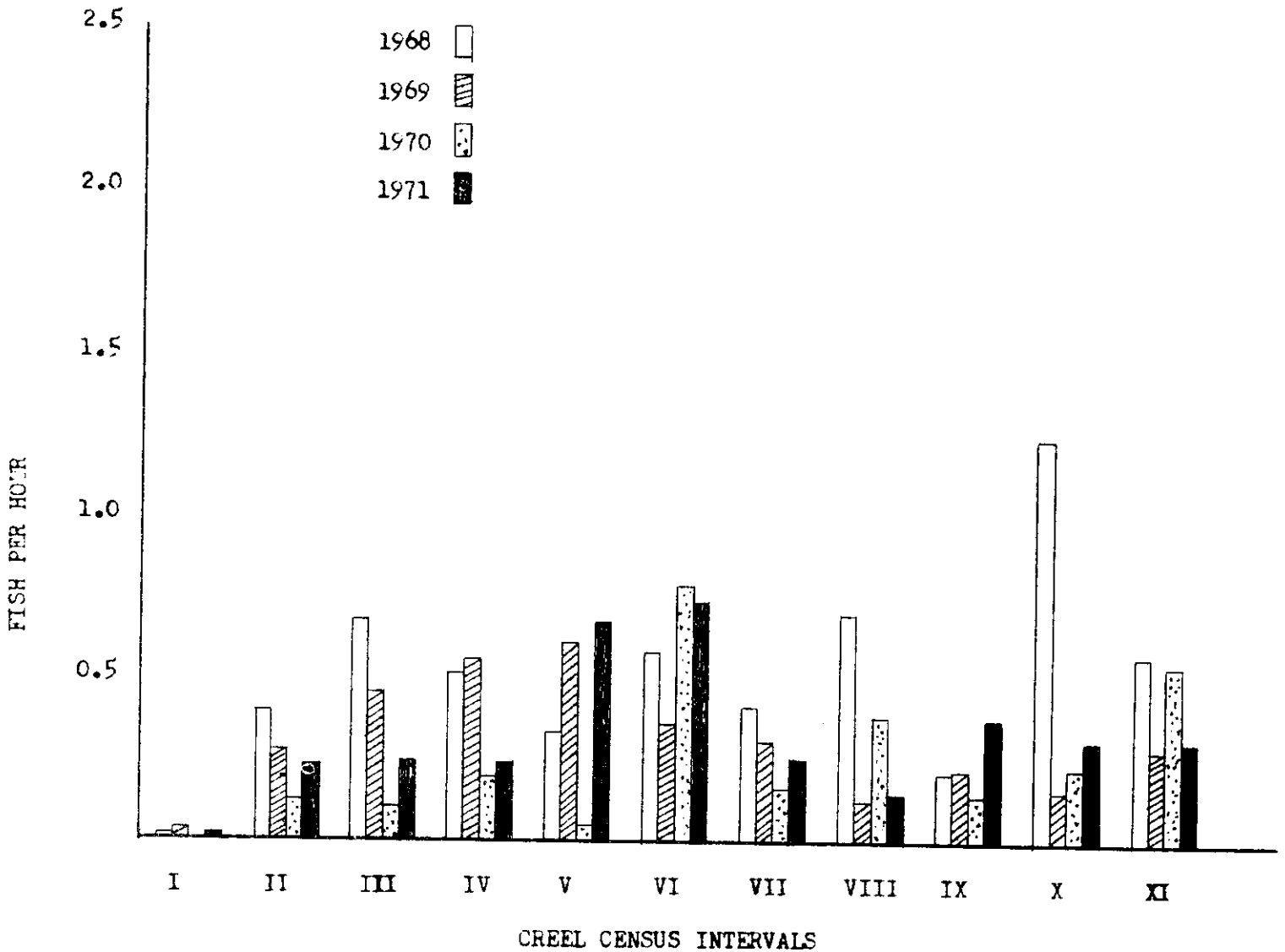

Figure 3. Catch rates of squawfish in fish per hour by bank anglers at Cascade Reservoir by two-week creel census intervals, 1968-1971.

The most significant change in catch rates during 1971 as compared to 1970 occurred with yellow perch. Boat angler catch rates for perch increased from .24 to .38 fish per hour while that for bank anglers increased from .21 to .60 fish per hour (Table 10). Overall average rainbow catch rates also increased for both boat and bank anglers from .22 to .26 and 14 to ,19 fish per hour, respectively (Table 10).

Species Composition

Horizontal gill nets fished a total of 240 hours at five locations in the main body of the reservoir during 1971 caught 9.3 percent rainbow trout, 3.6 percent
coho salmon, 11.9 percent yellow perch, 1-.7 percent bullhead, 60.2 percent squawfish, 12.9 percent suckers and 0.4 percent whitefish (Table 11).

Gill nets fished for 360 hours in the three reservoir arms during June and early July caught 1.8 percent rainbow trout, 4.5 percent coho salmon, 8.6 percent yellow perch, 2.6 percent bullhead, 55.6 percent squawfish, 26.2 percent suckers and 0.7 percent whitefish (Table 11).

Vertical gill net catches during 1971 indicated that yellow perch were concentrated between 20 and 30 feet in depth. The only rainbow and coho taken were also at that depth. Squawfish occurred at all depths while suckers were mainly at 20 feet. Bull-heads were taken from the surface to 30 feet deep (Tables 12 & 13),

Rainbow and Coho Age and Growth

Nearly 65 percent of the rainbow trout taken from Cascade Reservoir in 1971 were between 12 and 16 inches in total length (Table 14), Eighty-three percent of the coho salmon caught were between 10 and 14 inches in total length (Table 15).

Squawfish Age and Growth

Figure 4 shows the length frequency of 748 squawfish taken in horizontal gill nets during summer and fall of 1971, Age classes II, III and 1V are indicated by modal lengths of 180 mm, 240 mm and 360 mm, respectively.

Life History Studies

We took eight rainbow spawners from Willow Creek and 12 from Campbell Creek on May 18, 1971. The Willow Creek fish consisted of five females and three males; only two of the fish were considered to be "wild". Eight of the Campbell Creek fish were females, Only one of the fish taken in Campbell Creek was "wild".

Rainbow fry were numerous in Campbell Creek in early September, 1971. Mortality of these fry is probably quite high once they enter the reservoir so that they contribute very little to the catchable rainbow population.

A small percentage (5-10 percent) of the rainbow trout taken by anglers and in gill nets during August were found to be infested by parasitic copepods. Many suckers had heavy infestations of tapeworms. No unusual growths or tumors were found on any of the 1,000 fish examined.

Rainbow and Coho Emigration

From April 17 to September 17, 1971, anglers fished an estimated 11,924 hours on the section of the North Fork of the Payette River between Cascade Dam and the Highway 55 Bridge. They caught 3,463 rainbow trout (28.4 percent), 1,668 coho salmon„

Table 10. Comparison of estimated angling pressure, angler harvest, and overall average catch per hour at Cascade Reservoir for 1968, 1969, 1970, and 1971.

Year	Inclusive dates	Hours fished	Species caught and catch per hour					
			Rainbow	Coho	Perch	Bullhead	Squawfish	Total
			BOAT ANGLERS					
1968	4/13-10/25	32,324	7,757 .240	183 .006	8,481 .262	27 .001	27,909 .864	44,357
1969	4/19-10/31	38,776	9,343 .241	5,248 .135	12,750 .329	152 .004	12,664 .327	40,167
1970	4/18-10/30	53,330	11,481 .215	11,861 .222	12,781 .240	149 .003	11,334 .213	47,606
1971	4/17-9/17	59,631	15,495 .260	7,892 .132	22,789 .382	288 .005	9,754 .164	56,170
			BANK ANGLERS					
1968	4/13-10/25	27,471	5,487 .199	0 .000	6,919 .251	1,957 .071	14,615 .532	28,978
1969	4/19-10/31	27,918	6,168 .221	894 .032	3,625 .130	1,191 .043	8,496 .304	20,374
1970	4/18-10/30	24,845	3,602 .145	1,538 .062	5,154 .207	1,696 .068	4,333 .174	16,333
1971	4/17-9/17	25,233	4,761 .188	806 .032	15,222 .604	3,942 .156	8,061 .318	32,675

Table 11. Species composition of horizontal gill net catches at Cascade Reservoir, 1971.

Location	Date Set	Hours Fished	Species captured							Total
			Rb	Coho	Wf	Perch	Bull.	Sq. ♀ ♂ Juv.	CSS ♀ ♂ Juv.	
French Cr., mouth	5/18	24	7	10	0	0	0	37-13-11	2-3	83
Total (May)		24	7	10	0	0	0	37-13-11	2-3	83
Percent of total			8.5	12.0	0.0	0.0	0.0	73.5	6.0	
Catch per hour			.291	.417	.000	.000	.000	2.54	.208	3.46
North Fork arm	6/7	24	7	23	1	0	0	32- 8-14	6-10	101
Lake Fork arm	6/8	24	4	6	0	5	3	25-10- 9	3- 2-2	69
NE of Island	6/14	24	5	3	0	0	0	25- 1-19	9-12	74
North Fork arm	6/15	24	2	15	0	0	0	60- 6-18	10- 5	116
Lake Fork arm	6/16	24	0	4	0	5	3	18- 6- 8	6- 1	51
Gold Fork arm	6/17	24	3	3	1	0	1	13- 5- 1	39-21	87
North Fork arm	6/21	24	0	1	1	0	0	28- 2- 5	8- 2	47
Lake Fork arm	6/22	24	0	0	0	11	2	37- 4-18	8- 7	87
Gold Fork arm	6/23	24	2	0	1	2	1	41- 1- 6	34-12	100
North Fork arm	6/24	48	0	2	1	5	3	73-10-86	27-18-1	226
Total (June)		264	23	57	5	28	13	352-53-184	150-90-3	958
Percent of total			2.4	6.0	0.4	2.9	1.4	61.5	25.4	
Catch per hour			.087	.216	.019	.106	.049	2.23	.921	3.63
North Fork arm	7/1	24	1	1	1	14	15	14- 2-31	17-13-4	113
Lake Fork arm	7/2	24	1	0	2	14	3	5- 1-12	7- 6-3	54
French Cr., mouth	7/12	24	1	5	0	17	0	18- 4- 2	1- 2	50
North Fork arm	7/19	24	0	0	0	22	0	7- 0-13	2- 3-2	49
Gold Fork arm	7/20	24	2	0	0	1	0	10- 1- 5	18-16	53
Lake Fork arm	7/21	24	0	0	0	26	0	9- 2-23	2- 3-1	66
Total (July)		144	5	6	3	94	18	63-10-86	47-43-10	385
Percent of total			1.3	1.6	0.7	24.4	4.7	41.3	26.0	
Catch per hour			.035	.042	.021	.652	.125	1.10	.696	2.67

Table 11. Continued

Location	Date set	Hours fished	Species captured							
			Rb	Coho	Wf	Perch	Bull.	Sq.	CSS	Total
SW of Island	8/9	24	0	0	0	0	0	12	5	17
East shore, mid-res.	8/10	24	0	0	0	0	0	7	7	14
French Cr., mouth	8/16	24	0	0	0	11	0	31	3	45
SW of Island	8/30	24	7	0	2	1	6	16	10	42
East shore, mid-res.	8/30	24	5	0	0	5	3	5	3	21
Total (August)		120	12	0	2	17	9	71	28	139
Percent of total			8.6	0.0	1.4	12.2	6.5	51.2	20.1	
Catch per hour			.100	.000	.017	.142	.075	.592	.233	1.16
French Cr., mouth	9/2	24	20	1	0	29	0	71	9	130
SE corner of res.	9/2	24	4	0	0	0	0	45	2	51
Total (September)		48	24	1	0	29	0	116	11	181
Percent of total			13.2	0.6	0.0	16.0	0.0	64.0	6.2	
Catch per hour			.500	.021	.000	.604	.000	2.42	.229	3.77
Grand Total (May-September)		600	71	74	10	168	40	996	387	1,746
Percent of grand total			4.1	4.2	0.6	9.6	2.3	57.0	22.2	
Catch per hour			.118	.123	.017	.280	.067	1.66	.646	2.91
Main Reservoir Sets										
Total		240	49	19	2	63	9	317	68	527
Percent of total			9.3	3.6	0.4	11.9	1.7	60.2	12.9	
Catch per hour			.204	.079	.008	.262	.037	1.32	.283	2.19
Reservoir Arm Sets										
Total		360	22	55	8	105	31	679	319	1,219
Percent of total			1.8	4.5	0.7	8.6	2.6	55.6	26.2	
Catch per hour			.061	.152	.022	.292	.086	1.88	.839	3.39

Table 12. Species composition, temperature profile and depth distribution of fish captured in three vertical gill net sets SW of Sugarloaf Island, Cascade Reservoir, August 26, 1971.

Depth (ft.)	Temp. (°F)	Vertical Distribution (ft.)	Species captured					
			Rb	Coho	Perch	Bull.	Sq.	CSS
0	68	0- 5	0	0	0	1	1	0
5	65	5-10	0	0	0	0	1	0
10	62	10-15	0	0	1	2	1	1
15	59	15-20	0	0	0	0	0	0
20	58	20-25	0	1	5	0	3	4
25	57	25-30	1	0	10	1	2	0
30	56	30-35	0	0	0	0	0	0
35	56	35-40	0	0	0	0	1	1
			1	1	16	4	9	6

Table 13. Species composition, temperature profile and depth distribution of fish captured in three vertical gill net sets in the SE corner of Cascade Reservoir, August 27, 1971.

Depth (ft.)	Temp. (°F)	Vertical Distribution (Ft.)	Species captured					
			Rb	Coho	Perch	Bull.	Sq.	CSS
0	69	0- 5	0	0	0	2	0	0
5	65	5-10	0	0	0	0	2	0
10	63	10-15	0	0	0	2	0	0
15	59	15-20	2	0	6	0	5	2
20	57	20-25	0	0	4	0	0	3
			2	0	10	4	7	5

Table 14. Length frequency distribution of Cascade Reservoir rainbow trout measured in the creel, 1971.

Total length (inches)	Number of rainbow per two-week interval												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	Total	Percent
6-8			2	6				2		3		13	0.6
8-10			88	25	17	15	19	5	4	4	4	181	8.3
10-12	12	24	88	31	33	91	40	57	47	35	14	472	21.6
12-14	42	162	97	31	47	195	51	85	65	71	99	945	43.4
14-16	20	113	64	23	29	79	41	31	12	19	33	464	21.3
16-18	2	36	8	5	12	8	7	5	2	3	6	94	4.3
Over 18		3	1	1			3	2				10	0.5
Total	76	338	348	122	138	388	161	187	130	135	156	2,179	100.0

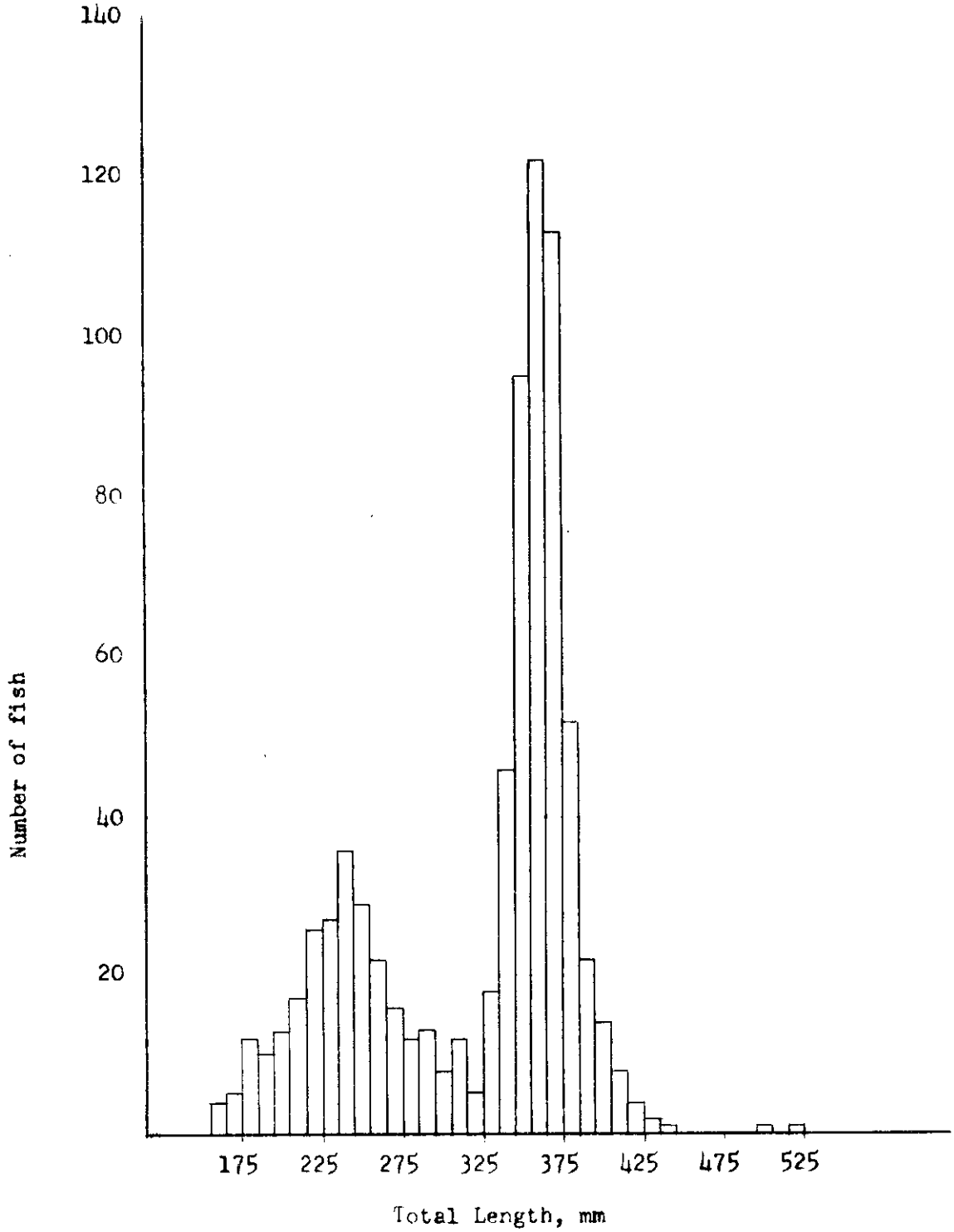

Figure 4. Length frequency distribution of 748 squawfish caught in horizontal gill nets at Cascade Reservoir, 1971.

Table 16. Estimates of total hours fished and catch by anglers fishing the North Fork Payette River between Cascade Dam and the Highway 55 Bridge from April 17-September 17, 1971.

Interval	Starting dates	Estimated hours fished	Estimated Catch					
			Rainbow	Coho	Perch	Bullhead	Squawfish	Total
I	4/17	281	59	82	0	0	0	141
II	5/1	432	137	10	0	0	0	147
III	5/15	979	323	146	187	11	31	698
IV	5/29	1,862	385	158	333	0	246	1,122
V	6/12	1,256	327	516	154	69	137	1,203
VI	6/26	2,535	510	294	309	0	309	1,422
VII	7/10	1,684	409	0	192	0	2,206	2,807
VIII	7/24	612	158	45	136	0	636	975
IX	8/7	655	191	48	119	0	606	964
X	8/21	655	322	103	0	0	642	1,067
XI	9/4	973	642	266	44	0	685	1,637
Total		11,924	3,463	1,668	1,474	80	5,498	12,183
Percent of catch			28.4	13.7	12.1	0.7	45.1	100.0
Catch per hour			.291	.140	.124	.007	.460	1.02

(13.7 percent), 1,474 yellow perch (12.1 percent), 80 bullhead (0.7 percent) and 5,498 squawfish (45.1 percent) (Table 16).

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